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Strychnine Poisoning of Aquatic Birds

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ABSTRACT: Strychnine poisoning was diagnosed in free-flying mallards (*Anas platyrhynchos*) and a ring-billed gull (*Larus delawarensis*) found dead on a pond in a zoo. The probable source of toxin was improperly applied strychnine-treated grain used for control of rodents on adjacent farm land. Ingesta of the birds contained 19.7–85.1 mg/kg of strychnine.

Key words: Strychnine, toxicosis, mallard, ring-billed gull, *Anas platyrhynchos*, *Larus delawarensis*.

Strychnine is a commonly used rodenticide and has been used as an avicide for control of species such as the pigeon (Redig et al., 1982). Strychnine poisoning is the most common toxicosis in domestic dogs in many areas (Blakley, 1984). There are few reports of strychnine poisoning of wild birds. In Saskatchewan, strychnine is registered for control of several "pest" species, including Richardson's ground squirrels (*Spermophilus richardsoni*) and northern pocket gophers (*Thomomys talpoides*) on agricultural land. For this purpose, a 2% solution of strychnine is available commercially to be mixed with grain to provide a final concentration of 2.5 mg strychnine/g dry grain bait. Directions on the container advise placing 5–15 g of treated seed into rodent burrows, and warn against leaving treated grain on the surface where it would be available to non-target wildlife.

On the morning of 17 June 1986 the carcass of an adult female mallard (*Anas platyrhynchos*) and of an adult male ring-billed gull (*Larus delawarensis*) were submitted to the diagnostic laboratory, Department of Veterinary Pathology, Western College of Veterinary Medicine. These were free-flying birds that had been found dead on the edge of a pond within a large waterfowl compound at a local zoo. The zoo is located on the outskirts of Saskatoon and is surrounded on three sides by agri-

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TABLE 1. Concentrations of strychnine in the ingesta from the esophagus and proventriculus, and in the liver of birds from a local zoo in Saskatoon, Saskatchewan.

Species	Sex	Weight (g)	Strychnine (mg/kg)	
			Ingesta	Liver
Mallard	♀	1,320	85.1	11.9
	♂	1,153	42.0	3.1
	♂	1,332	19.7	ND[a]
	♀	1,200	36.7	4.4
Ring-billed gull	♂	428	68.8	1.8

[a] ND, none detected.

cultural land. Wild birds fly in and out of the compound regularly. Later the same day, three adult wild mallards (two males, one female) were found dead in the compound. These birds had not been present when the compound was checked earlier in the day. Many species of pinioned waterfowl resident on the pond were not affected.

At necropsy, all birds had intact kernels of barley in the esophagus and proventriculus, and a few partially digested kernels in the ventriculus. One of the male mallards and the gull had ecchymotic hemorrhages in the superficial layers of the myocardium, but other gross lesions were not observed. The amount of barley in the upper alimentary tract was remarkably similar in the four ducks, each of which had between 11.8 and 12.0 g of grain present; 4.3 g of barley were present in the gull. One of the ducks found dead in the afternoon had 1.0 g of aquatic insect larvae in the upper esophagus, proximal to the barley, indicating this material had been ingested after the grain. Portions of liver, lung, heart, spleen, kidney, intestine and brain were preserved in 10% buffered formalin, and subsequently processed for histological examination. Significant microscopic lesions were not found. Contents of the esophagus and proventriculus, together with a portion of liver from each bird were sent for strychnine analysis to the toxicology analytical laboratory, Department of Veterinary Physiological Sciences. Homogenates of these extracted with chloroform and dilute sulfuric acid were analyzed quantitatively for strychnine using ultraviolet spectrophotometric techniques (Sunshine, 1975). Strychnine was present in all samples of ingesta, and in the liver of four of the birds (Table 1).

Intoxication was suspected in these birds because of the lack of gross lesions to explain their death, and strychnine was suspected as a specific agent because of the evidence of recent consumption of grain. Barley often is used to prepare strychnine baits for ground squirrel control, although wheat and oats are the bait grains recommended by the commercial supplier of the concentrated solution. In this case, we suspect that strychnine baits had been used for rodent control on agricultural land adjacent to the zoo, and that the bait was used incorrectly by leaving treated grain on the surface. We were unable to identify a specific site where there had been "gopher" poisoning at the time that the birds died. Also, we cannot eliminate the possibility of malicious poisoning. Small groups of mallards often are seen feeding in agricultural fields in this area throughout the summer and these birds likely flew to the pond in the zoo after ingesting the treated grain. Approximately 2 wk later, a Richardson's ground squirrel was found dead near the perimeter fence of the zoo. This animal also had barley in its stomach. Strychnine was found in the stomach contents and liver (22.2 and 12.1 mg/kg, respectively), providing further evidence for the use of strychnine for rodent control in the area.

The toxic dose of strychnine for ducks apparently has not been determined. Schafer (1972) determined the LD_{50} of strychnine sulfate to be <5.0 mg/kg for the starling (*Sturnus vulgaris*) and 5.6 mg/kg for the house finch (*Carpodacus mexicanus*). The lethal dose for the domestic chicken has been listed as 2 mg/kg (Garner, 1957), or 5 mg/kg (Buck et al., 1976).

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Redig et al. (1982) described strychnine poisoning of mallards, in association with use of strychnine-treated corn bait for pigeon eradication, but did not provide data on tissue levels in the ducks. If the lethal dose for ducks is similar to that for the birds listed above, as little as 3 g of "properly prepared" rodent bait would be sufficient to kill many ducks. The relatively low concentration of strychnine in the ingesta, together with the presence of strychnine in the liver and evidence of subsequent feeding in one bird, suggests that the birds survived for some time after eating the toxin and that much of the dose had been absorbed. This, as in many other instances of poisoning in wildlife, was probably the result of improper or inadvertent use of a pesticide. In the case of strychnine, there is also the risk of "relay" or secondary poisoning of carnivores through consumption of animals that have died of the poison (Redig et al., 1982).

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